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Si memory chip as a sensitive neutron detector

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Abstract

A novel neutron detector is based on semiconductor technology. A boron-containing film is an integral part of the semiconductor device and is in physical contact with the charge-storage medium (CSM). The CSM is a proprietary cell design known as MirrorBit^{TM}, which is different from conventional memory designs such as SRAM or DRAM. The design doubles the resolution and sensitivity in the array. This enables a highly effective detection of the secondary particles, ^{7}Li and ^{4}He, produced due to neutron capture by ^{10}B in the device. Other approaches using semiconductor materials for neutron detection have employed single-diode detectors that require off-system preamplifiers to filter and condition the signal.

There are several advantages to this non-volatile detector, one being that it requires no power for detection and retains the signal until reset. Further, this detector, a semiconductor chip, can be seamlessly integrated into other systems. Finally, the semiconductor manufacturing process on which the detector is based will allow for a high-volume and low-cost alternative to current detectors.

MirrorBit^{TM} chips were exposed to neutron flux and the signals recorded. Detailed results from this experiment will be described in this presentation.

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